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MODEL 275
I-F CONVERTER

Operating INSTRUCTIONS

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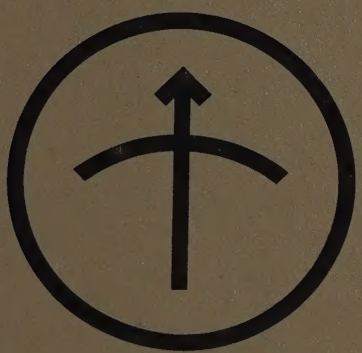

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KING LABORATORIES INC.
MEASUREMENTS
A McGRAW-EDISON DIVISION
BOONTON NEW JERSEY

MODEL 275
I-F CONVERTER

Operating
INSTRUCTIONS

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VIKING LABORATORIES INC.

MEASUREMENTS

A McGRAW-EDISON DIVISION

BOONTON **NEW JERSEY**

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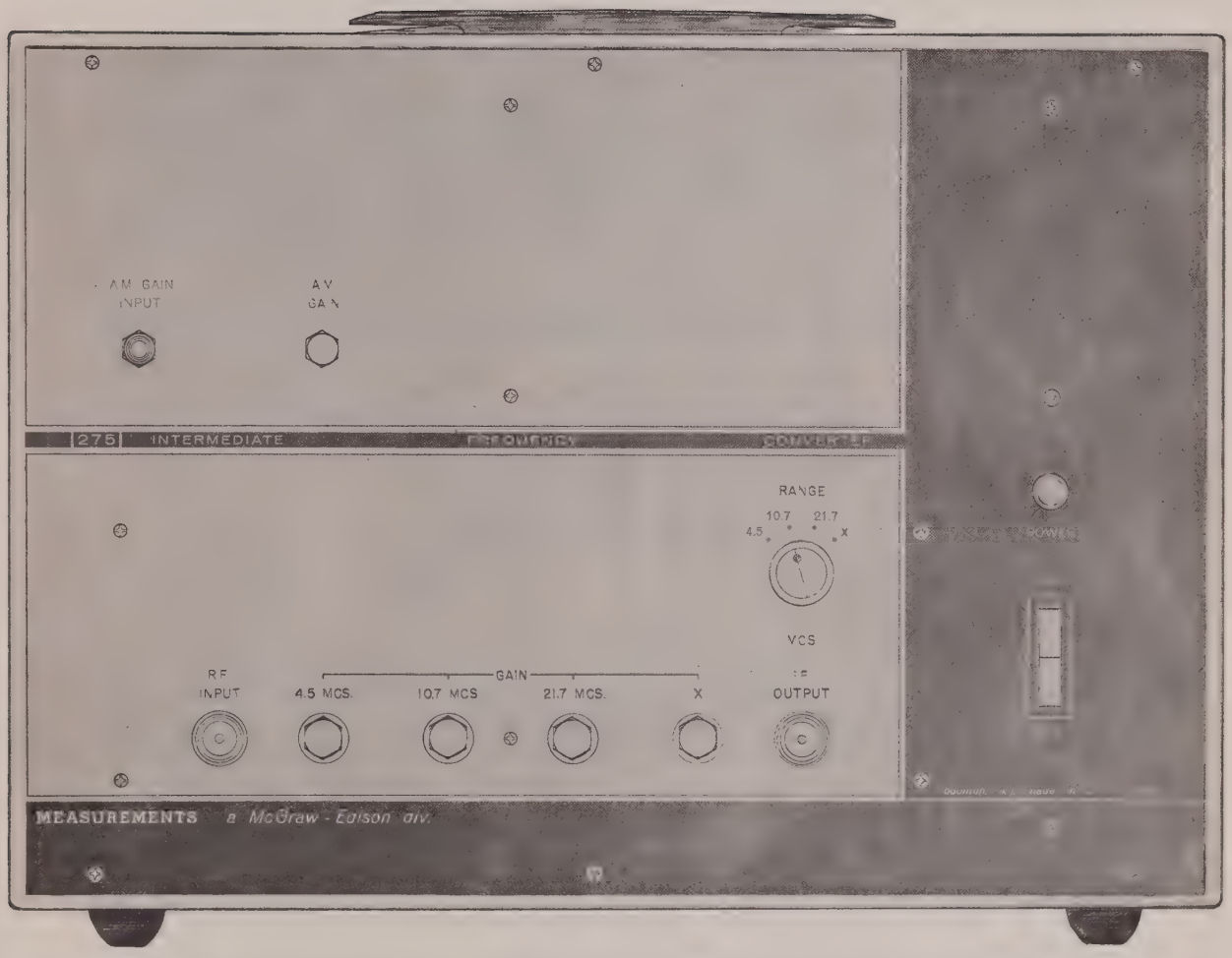
Additional information with regard to the applications and maintenance of this equipment will be available from time to time. Users of the Model 275 I.F. Converter are urged to discuss their problems with us and to suggest such modifications as might make the instrument more adaptable to their special requirements.

Whenever possible, maintenance difficulties should be reported to Measurements before proceeding with the actual repairs. Through our familiarity with the instrument, we are in a position to suggest the most expedient and accurate repair procedure.

Your Model 275 I.F. Converter has been designed and manufactured to the highest standards of instrument quality. With reasonable care, many years of trouble-free service can be expected of it.

Engineering Department
MEASUREMENTS
A McGraw-Edison Division
Boonton, New Jersey



Front View of Model 275 I-F Converter

CHAPTER 1

INTRODUCTION

SECTION I

GENERAL

1. SCOPE OF MANUAL

a. This manual describes the basic operation, construction and maintenance of the Model 275 I-F Converter. Following the text of the manual are two appendices. Appendix I describes the recommended procedure for preparing the instrument for prolonged storage or reshipment. Appendix II contains an Identification Table of Replaceable Parts, listing the reference symbols, name, description, and drawing number of each part required for maintenance.

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SECTION II

DESCRIPTION AND DATA

2. GENERAL

a. The Model 275 is a radio-frequency converter designed for use with an FM signal generator covering 86 to 108 megacycles to provide frequency coverage in the intermediate-frequency ranges of 4.5 Mc, 10.7 Mc and 21.7 Mc. Additional continuous coverage is also provided from 4 Mc to 20 Mc.

The Model 275 I-F Converter increases the field of application of FM signal generators, such as the Model 188-, because it provides up to a one-volt output in the FM and Television receiver intermediate-frequency ranges. This permits the user to check i-f amplifier and discriminator performance directly at carrier levels which are high enough for single-stage measurements.

b. The appropriate signal generator output frequency mixed with the fixed 82-Mc heterodyne oscillator frequency produces the desired difference frequency, which is then amplified by a wide-band amplifier, and further amplified by a tuned amplifier tuned to the desired i-f frequency. In the X position, a resistive load is substituted for the tuned circuit of the latter amplifier so that it provides broad-band coverage of 4 Mc to 20 Mc at reduced gain.

2.b. - Continued

Amplitude modulation of the input signal up to 80% is produced by the Model 275 combined with, or exclusive of FM, by application of an audio-frequency voltage from an external audio-frequency source.

3. TECHNICAL CHARACTERISTICS

a. Frequency Ranges:

1. I-F Ranges - 4.5 Mc, 10.7 Mc and 21.7 Mc.
2. X Range - 4 Mc to 20 Mc.

b. Gain:

1. I-F Range Gain is 10 when no AM is produced. Gain is dropped to 5 when AM is produced internally.
2. X Range Gain is approximately 1.0 when no AM is produced. Gain is dropped to approximately 0.5 when AM is produced internally.

c. Output Voltage:

1. I-F Range - 1 volt output for signal generator input of 0.1 volts and continuously variable by means of attenuator of signal generator. Output voltage drops 50% when AM is produced internally.
2. X Range - approximately 0.1 volt output for signal generator input of 0.1 volt, and continuously variable by means of attenuator of signal generator. Output voltage drops 50% when AM is produced internally.

d. Output System:

1. The Model 275 is designed to operate into a 50-ohm load. A 50-ohm terminated cable, Measurements Part No. 80-ZH4, is supplied for this purpose.

e. Amplifier Frequency Response:

1. I-F Ranges - Less than 0.5 DB down $\pm$ 250 Kc from center frequency.
2. X Range - Approximately $\pm$ 2 DB from 4 Mc to 20 Mc.

f. Amplitude Modulation:

1. Up to approximately 80% AM, combined with, or exclusive of, FM. There is negligible spurious FM due to AM. The envelope distortion is less than 10% at 80% modulation. 2.25 volts RMS input across 100K ohms will produce approximately 70% AM. Frequency response is flat from DC to 5 Kc.

g. Power Source:- 115 volts, 50-60 cycles, 45 watts.

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3.g. - Continued

The Model 275 Power Transformer T1 is provided with a dual section primary wired in parallel for 115 V AC operation or in series for 230 V AC operation.

The Model 275 is normally wired for 115 V AC operation unless otherwise specified.

4. COMPONENTS SUPPLIED.

a. See Table I. Table of Components

TABLE I. TABLE OF COMPONENTS

Quan.	Description	Dimensions			Unit Weight	Volume Cu. Ft.
		Height	Width	Depth		
1	Model 275 I-F Converter.	11 1/2"	14 1/2"	7 3/4"	Approx. 15 lbs.	0.75
1	Manual of Operating Instructions					
1	Tube, 6C4, installed.					
3	Tubes, 6AK5, installed.					
1	Tube, OD3, installed.					
1	80-ZH4 Cable.					
1	Cable, (H-5730).					

CHAPTER 2

OPERATING INSTRUCTIONS

SECTION I

SERVICE UPON RECEIPT OF EQUIPMENT

6. UNPACKING

a. Take care when unpacking or handling the equipment. Follow the procedure outlined below when unpacking the instrument.

(1) Place the packing case in a location where it can be opened easily.

(2) If the instrument is packed in a wooden case, extract nails with a nail puller and remove the top of the packing case; if the instrument is packed in a carton, slit top of carton carefully.

(3) Lift the instrument from the packing case and remove the paper wrapping.

(4) Inspect the case and controls on the front panel for possible damage during shipment.

7. PRELIMINARY OPERATIONAL CHECKS

a. Connect the Model 275 to a power source of 115 volts, 50-60 cycles.

b. Flip the rocker switch on the front panel and the pilot light should then indicate that the instrument is turned on.

c. During a warm-up period of at least 15 minutes, the necessary connections between the Model 188 and the Model 275 can be made with the cables listed under paragraph 24.

d. Set the Model 188 for 0.1 volt output at 86.5 Mc and measure the 4.5 Mc output of the Model 275 with a vacuum-tube voltmeter connected to the binding posts on the type 80-ZH4 cable. Adjust the frequency of the Model 188 for a maximum output. This output should be approximately 1 volt. Repeat this procedure for the 10.7 and 21.7 megacycle I-F RANGES.

SECTION II

CONTROLS AND INSTRUMENTS

8. POWER

a. Power is supplied to the instrument from a 115 volt 50-60 AC source thru a 3 wire grounded cable which is connected into a 3 prong male connector P2 located on the rear cover below the fuse holder.

b. The POWER switch, S1, located in the lower right hand corner of the front panel controls the application of line voltage to the primary of the power transformer, T1.

9. FUSE

a. The FUSE, F1, located on the rear cover of the instrument serves to protect it against overloads.

10. RANGE MC

a. The RANGE MC knob on the right-hand side of the front panel switches the appropriate circuits for 4.5 MC., 10.7 MC., 21.7 MC., or X Band output.

11. RF INPUT

a. The radio-frequency carrier is connected to the type-N jack marked RF INPUT located on the lower left-hand side of the front panel.

12. IF OUTPUT

a. The intermediate frequency output, as selected by the RANGE MC switch is obtained from the type-N jack marked IF OUTPUT on the lower right-hand side of the front panel.

13. AM MOD INPUT

a. Amplitude Modulation is obtained by connecting a source of audio frequency to the AM MOD INPUT jack located in the upper left-hand side of the aluminum panel.

14. AM GAIN

a. The capped control marked AM GAIN permits the adjustment of the gain of the Model 275 to a nominal value of 5 for the I-F ranges and to a value of 0.5 for the X range, when amplitude modulation is produced by the Model 275.

15. 4.5 MC GAIN

a. The capped control marked 4.5 MC GAIN permits the adjustment of the gain of the 4.5 Mc I-F amplifier to a nominal value of 10.

16. 10.7 MC GAIN

a. The capped control marked 10.7 MC GAIN permits the adjustment of the gain of the 10.7 Mc I-F amplifier to a nominal value of 10.

17. 21.7 MC GAIN

a. The capped control marked 21.7 MC GAIN permits the adjustment of the gain of the 21.7 Mc I-F amplifier to a nominal value of 10.

18. X GAIN

a. The capped control X GAIN permits the adjustment of the gain of the 4 Mc to 20 Mc output to a nominal value of 1.

SECTION III

OPERATION

19. CABLE CONNECTIONS

a. Connect the output of the Model 188 to the input of the Model 275 with a type H-5730 cable or with an equivalent 50-ohm cable. Connect the type 80-ZH4 cable to the output type-N fitting of the Model 275. This cable is a 50-ohm cable terminated at the output end with a 50-ohm resistor connected to a pair of binding posts.

20. SETTING CARRIER FREQUENCY

a. Set the Model 188 to the proper carrier frequency as listed in 20.b.

b. Since the internal oscillator in the I-F Converter operates at a frequency of 82 Mc, the beat produced is the difference between the 82 Mc oscillator and the carrier frequency of the Model 188.

Output Carrier Range	Set Model 188 to:
4.5 Mc	86.5 Mc
10.7 Mc	92.7 Mc
21.7 Mc	103.7 Mc
4 Mc to 20 Mc	86 Mc to 102 Mc

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21. SETTING OUTPUT VOLTAGE

a. The I-F Converter is adjusted at the factory to give a maximum output of one volt when used with the Model 188. To arrive at the actual i-f carrier amplitude at the output of the Converter, the operator must multiply the microvolt readings shown on the Model 188 attenuator by 10, or by 1.0 for the X range. A 100 K microvolt carrier from the Model 188 will produce a 1.0 volt i-f carrier from the I-F Converter. Since the Converter operates as a linear amplifier, this gain factor will remain constant throughout the operating range of the attenuator. If it becomes necessary to know the absolute i-f carrier amplitude,,voltage measurements may be made as described in Section II.

22. APPLYING AMPLITUDE MODULATION

a. Amplitude Modulation of the Model 275 may be accomplished by inserting a plug, connected to an external audio source, in the jack labeled AM MOD INPUT. The insertion of the plug changes the gain of the converter to one-half of the normal value so that it is necessary to multiply the readings of the Model 188 attenuator by five instead of ten for the I-F RANGES and by 0.5 instead of 1 for the X RANGE. The input impedance at the modulation jack is approximately 100 K ohms and 2.25 volts RMS input will provide approximately 70% modulation. The modulation percentage is flat from DC to 5 Kc, dropping off slightly at the higher frequencies. Since there is a DC connection to the modulated tubes, there should be no superimposed DC on the modulating voltage.

23. APPLICATIONS

a. The Model 275 I-F Converter is primarily designed for use in measuring the performance of FM and television i-f sound channels.

b. The Model 275 can be used with a CW signal generator if amplitude modulation of this signal with negligible accompanying parasitic incidental FM is desired. If the CW signal generator covers the frequency range of 83 to 112 megacycles, useful output is available from the Model 275 over the frequency range of 1 Mc to 30 Mc on the X RANGE or at 4.5 Mc, 10.7 Mc and 21.7 Mc on the corresponding I-F RANGE.

c. The 4.5 megacycle channel can be used with a television sound i.f. using difference detection. The output circuit can be retuned to cover 4.3 Mc i-f amplifiers, if necessary.

d. The 10.7 megacycle i-f channel is the RMA standard for FM receivers. This output can also be retuned to cover slightly different channels, such as 9.8 Mc, 12 Mc, etc.

e. The 21.7 Mc output will cover all RMA standard television sound channels between 21.25 and 21.9 Mc. This output is rather broadly tuned, so that it is not necessary to retune the output circuit for the above frequency selection.

f. On the three I-F RANGES one volt is available, so that high-level i-f stages can readily be checked for bandwidth. By use of a simple diode detector, the frequency response of each individual i-f stage can be measured with the aid of an oscilloscope, synchronized with the internal 400-cycle modulation of the Model 188. This 400-cycle synchronizing voltage can be obtained from the external modulation binding posts of the Model 188.

g. It is sometimes convenient to make a low-gain amplifier out of a succeeding i-f stage by connecting a 100-ohm plate load resistor to the by-passed B+ bus; then connect the diode detector which feeds the oscilloscope amplifier across the output of this low-gain amplifier. Markers can be coupled in from an auxiliary source, such as our Model 59 Megacycle Meter, or from a signal generator, such as the Model 180. The sharpness of these beat markers can be improved by reducing the transmission bandwidth of the oscilloscope. This can be accoplished by inserting a series 1-megohm resistor and a shunt 100-mmfd capacitor across the oscilloscope input terminals.

h. The response of limiter discriminator combinations and of ratio detectors to spurious AM may be checked by amplitude modulating the Model 275, 70-80% from an external source and checking the FM receiver for spurious output. Either FM and AM combined, or AM alone may be used for this check. It is customary to use considerably different audio frequencies for combined FM and AM, so that any spurious output may be easily detested.

CHAPTER 3

EQUIPMENT USED IN CONJUNCTION WITH MODEL 275

SECTION I

ACCESSORIES

24. RECOMMENDED ACCESSORIES (Supplied with Model 275)

a. Measurements Part No. H-5730 Cable - a 50-ohm coaxial cable terminated at both ends in type-N male connectors.

b. Measurements Part No. 80-ZH4 Output Cable - a 4 ft. 50-ohm coaxial cable terminated in a male type-N connector at one end and in a pair of binding posts with a 50-ohm terminating resistor at the other end.

25. RECOMMENDED AUXILIARY EQUIPMENT

a. Measurements Model 188 Standard FM Signal Generator - an FM signal generator covering the carrier frequency range of 86 to 110 Mc and providing maximum deviation of ± 300 Kc.

CHAPTER 4

MAINTENANCE INSTRUCTIONS

SECTION I

MAINTENANCE

26. GENERAL

a. Preventive maintenance procedure is not recommended for the Model 275. Preventive maintenance is a series of operations including inspection, adjustment, lubrication, etc., recommended periodically for certain types of equipment to eliminate the possibility of unexpected interruptions in service. Critical adjustments may be disturbed by too frequent inspection by personnel unfamiliar with the design of the Model 275. This may result in maladjustments causing errors in data that would be much more serious than an occasional operational failure.

b. If failure occurs, the instrument should be checked by the procedure outlined in Paragraph 7 (PRELIMINARY OPERATIONAL CHECKS), and if trouble other than a defective tube is indicated, the instrument should be returned to Measurements.

c. If the seal on the instrument is broken without the permission of Measurements, the one-year guarantee will be void.

27. REMOVAL OF INSTRUMENT FROM CASE

a. To remove the Model 275 from its case, disconnect the power cord. Unscrew the six 6-32 Phillips head screws along the outside edges of the front panel and the screw in the sealed cup washer located below the fuse holder. Carefully slide the instrument forward out of its case.

28. SERVICE PROCEDURE

a. Tube Replacement:

With the instrument removed from its case, the regulator tube OD3/VR-150 can be replaced easily. To replace the three Type 6AK5 tubes, it is necessary to remove the shield cover from the r-f section by removing the 6-32 screw from the top center of the cover and pulling the shield straight away from the front panel. The three 6AK5 tubes are grouped in a straight line at the lower center portion of the r-f chassis. To replace the 6C4 oscillator tube remove the 6-32 screw in the center of the oscillator compartment shield cover straight away from the panel.

b. Pilot Light Replacement:

The Pilot Light Assembly located on the right side of the front panel above the Power Switch contains a neon glow lamp with a suitable resistor, operating on 115 V AC. The lamp and resistor are permanently built in and in the event of a burn-out the Pilot Light Assembly must be replaced.

With the instrument removed from the case the Pilot Light Assembly can be easily replaced.

c. Power Line Fuse:

The power line fuse may be easily removed from the fuse holder on the rear cover. Repeated blowing of this fuse indicates a probable short in the power transformer or a short in the filament or B-supply circuits. Under no circumstances should this fuse be replaced with one of a larger rating, as serious damage to the instrument may result.

d. Additional I-F Frequency Range:

The Model 275 has been so designed that an additional I-F RANGE can be substituted for the X RANGE. As the upper frequency limit of the low-pass filter circuit is approximately 25 Mc, no attempt should be made to design for a frequency above 23 Mc.

To add an additional range, remove R29 and C30 connected to the RANGE switch. Remove the blank coil form provided, and wind a plate coil and an output coil for the frequency desired; then terminate the windings on the copper lugs on the form. Connect the plate coil windings to a pair of lugs at one end of the form, and the output windings to the opposite pair of lugs. Caution should be taken so that when the coil form is mounted into position, the plate coil lugs will be at the top (nearest to the coil form holder).

The lower switch deck is the output section. Connect one end of the output winding to the only open switch lug on this deck. Ground the other end of the output winding to the Shakeproof solder lug provided at the base of the coil bracket. The middle switch deck is the plate section. Connect the low r-f end of the plate coil to the switch lug that is by-passed with the .002 mica capacitor. Connect the high r-f end of the plate coil to the adjacent open switch lug. The top deck of the switch is the output control section and is already wired to the correct potentiometer.

The coil serves as an impedance matching transformer. To match the impedance of the plate circuit of the amplifier to the output cable, select the proper turns ratio and coupling to obtain a 1-volt output with a band width of at least ± 250 Kc.

29. ADJUSTMENT PROCEDURE

a. Calibration of Overall Conversion Gain:

The Model 275 is equipped with individual controls to set the conversion gain of each frequency range. These screwdriver controls are located on the front panel between the input and the output jacks. Starting with the 4.5 Mc conversion gain control next to the RF INPUT jack, the potentiometers from left to right are 4.5-Mc, 10.7-Mc, and X-RANGE position controls. To adjust these controls it is necessary to remove the knurled caps by turning them counterclockwise. In general, it should not be necessary to touch these controls unless tube replacement or unusual conversion gain requirements make it advisable.

If gain readjustment is necessary, employ the following adjustment procedure. Insert an open-circuited phone plug in the AM MOD INPUT jack and connect a vacuum-tube voltmeter, such as Measurements Model 162 to the binding posts of the type 80-ZH4 cable connected to the output of the Model 275. Set the RANGE - MC switch to the 4.5 Mc position, and with the output of the Model 188 set for 0.1 volt, tune for maximum output of the Model 275. Then adjust the 4.5 MC GAIN control for a reading of 0.5 volt on the vacuum-tube voltmeter. Repeat this procedure for 10.7 Mc and 21.7 Mc.

Remove the plug from the AM MOD INPUT jack and adjust the AM GAIN control for a reading of 1.0 volt. This can be done on any of the I-F RANGE positions. Next, se the Model 188 for 0.1 volt output at 90 Mc, switch the RANGE-MC switch to the X position and adjust the X GAIN control for 0.1 volt output.

For further information see SECTION II.

b. Calibration of Internal Oscillator:

If severe vibration or tube replacements cause a change in the frequency calibration of the 82 Mc oscillator, it may be necessary to readjust the oscillator trimmer. This adjustment should be made after the instrument has had at least a 15-minute warm-up period. The oscillator shield box must be securely in place.

With an accurate frequency measuring device (such as a frequency meter) coupled to the RF INPUT jack of the I-F Converter, adjust the oscillator trimmer until its frequency is 82 Mc.

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c. Calibration of Percentage Modulation:

If an accurate check on the percentage of amplitude modulation is desired, it can most easily be obtained by the familiar trapezoidal pattern method on an oscilloscope. If the vertical amplifier of the oscilloscope will respond to 4.5 Mc, the output of the Model 275 may be plugged directly into the vertical amplifier input, and the modulating voltage applied to the horizontal axis. If the vertical amplifier will not respond to 4.5 Mc, a coil resonated at 4.5 Mc by a condenser, can be placed directly across the vertical plates and coupled to the output of the Model 275 with a coupling loop of a few turns. The percentage modulation can then be determined from the expression:

$$\% \text{ Modulation} = 100 \left(\frac{b - a}{b + a}\right)$$

where a = the height of the short end of the trapezoid and b = the height of the long end of the trapezoid.

In this check, care should be taken to avoid overload of the oscilloscope amplifiers, and in doubtful cases the resonated coil directly across the plates should be used. The percentage modulation remains constant regardless of the i-f output frequency.

SECTION II

ACCURACY

30. GENERAL

a. Since the Model 275 I-F Converter is not a self generator of i-f carrier frequencies, its voltage and frequency accuracy is dependent upon the accuracy of its companion Model 188 Signal Generator. Accuracy of i-f carrier frequency will be proportional to the tolerances of the Model 188 Standard FM Signal Generator. Refer to the Model 188 Instruction Book for tolerances.

b. Overall Conversion Gain:

The I-F Converter is adjusted at the factory to give an output of 1.0 volt ± 5% with the Model 188 controls set for 0.1 volt. If an accurate measurement of the i-f output voltage is desired, it can be measure d with a Measurements Model 162 Vacuum-Tube Voltmeter. Connect the output termials of the Type 80-ZH4 output cable to the diode probe terminals of the Model 162 with short leads. The i-f output voltage may then be read directly on the one-volt range of the Model 162.

Note: The Model 188 must be tuned for maximum i-f output voltage.

Should the conversion gain require adjustment, the correct potentiometer may be used (see Paragraph 29 a) to set the conversion gain to the required level. The conversion gain of the I-F Converter is a function of the line voltage. If very accurate i-f carrier voltages are desired, the I-F Converter and its companion Model 188 should be operated on a good power-line voltage regulator.

c. I-F Output Frequency:

The internal 82-Mc oscillator is calibrated at the factory to ± 0.5%, which is the same order of accuracy as the Model 188 carrier-frequency calibration. If maximum accuracy of the output frequency of the i-f carrier is required, it should be checked by a suitable frequency standard.

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The i-f carrier may be checked with a heterodyne frequency meter or with a crystal calibrator, and the frequency of the Model 188-A adjusted until an i-f carrier of the desired accuracy is obtained. (Do not apply FM during this check). Another possibility is the use of an accurate signal source as a marker frequency which can be coupled to the i-f amplifier under test and viewed directly on the oscilloscope. This method provides a continual check of the i-f carrier calibration and a frequency marker for checking deviation.

d. 82-Mc Oscillator:

Unless the Model 275 is subjected to severe vibration or a 6C4 oscillator tube replacement is necessary, the calibration of the 82-Mc oscillator should not require attention. If the frequency of the internal oscillator requires adjustment, the instrument must be taken out of its case and the r-f shield box cover removed. (See Paragraph 28a). The internal oscillator frequency trimmer can be adjusted through a hole in the oscillator shield can. Adjust this trimmer for 82 Mc.

e. I-F Pass Band:

The pass band of the I-F Converter is +0 -5% at ± 250 Kc from center frequency on the 4.5 MC RANGE. This pass band is considerably wider on the two higher frequency ranges.

f. 82-Mc Oscillator Leakage:

The 82-Mc leakage at the output terminals is less than 50 microvolts. The 82-Mc leakage field around the instrument case is low.

g. Spurious Response:

The spurious output of the I-F Converter, due to extraneous harmonic conversion, other than i-f carrier harmonics is down over 80 db (.01%) from the i-f carrier level on the I-F RANGES.

h. Residual Hum Modulation:

The residual hum modulation of the I-F Converter is more than 60 db down from 75 Kc carrier deviation.

APPENDIX I

STORAGE AND SHIPMENT

1. STORAGE

a. Remove dust from controls and outer surface of instrument with a clean rag.

b. Wrap instrument in heavy wrapping paper and seal seams with gummed tape or similar adhesive.

c. Store in a dry place. If excessive humidity is unavoidable, the wrapped instrument should be placed in a moisture-proof bag with a sufficient quantity of drying agent, such as silica gel, to insure a dry atmosphere. When the use of bag and desiccant is necessary, the instrument should be checked at six-month intervals to determine the effectiveness of the seal.

2. SHIPMENT

a. Wrap the instrument with heavy wrapping paper and seal seams with gummed tape or similar adhesive.

b. Place in fibre-board carton or wooden box large enough to permit at least three inches of excelsior or similar packing material between the instrument and sides of the box. For export packing, the instrument must be wrapped in waterproof paper and the seams sealed with waterproof glue or similar sealing compound before being placed in a wooden box.

TABLE OF REPLACEABLE PARTS

Model 275 I.F. Converter

Symbol	Measurements Part Number	Description
Capacitors		
C1	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C2	H-5172	Mica, 100 mmf, ± 20%, 500 WVDC
C3	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C4	H-5011	Ceramic, feed-thru, 1500 mmf.
C5	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C6	H-5326	Mica, 2000 mmf, ± 20%, 500 WVDC
C7	H-5011	Ceramic, feed-thru, 1500 mmf.
C8	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C9	H-5172	Mica, 100 mmf, ± 20%, 500 WVDC
C10	H-5326	Mica, 2000 mmf, ± 20%, 500 WVDC
C11	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C12	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C13	H-5005	Electro, 40 mf, 150 WVDC
C14	H-5326	Mica, 2000 mmf, ± 20%, 500 WVDC
C15	H-5011	Ceramic, feed-thru, 1500 mmf.
C16	H-5011	Ceramic, feed-thru, 1500 mmf.
C17	H-5011	Ceramic, feed-thru, 1500 mmf.
C18	H-5011	Ceramic, feed-thru, 1500 mmf.
C19	H-5011	Ceramic, feed-thru, 1500 mmf.
C20	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC
C21	H-5007	Variable, air, 3.9-50 mmf.

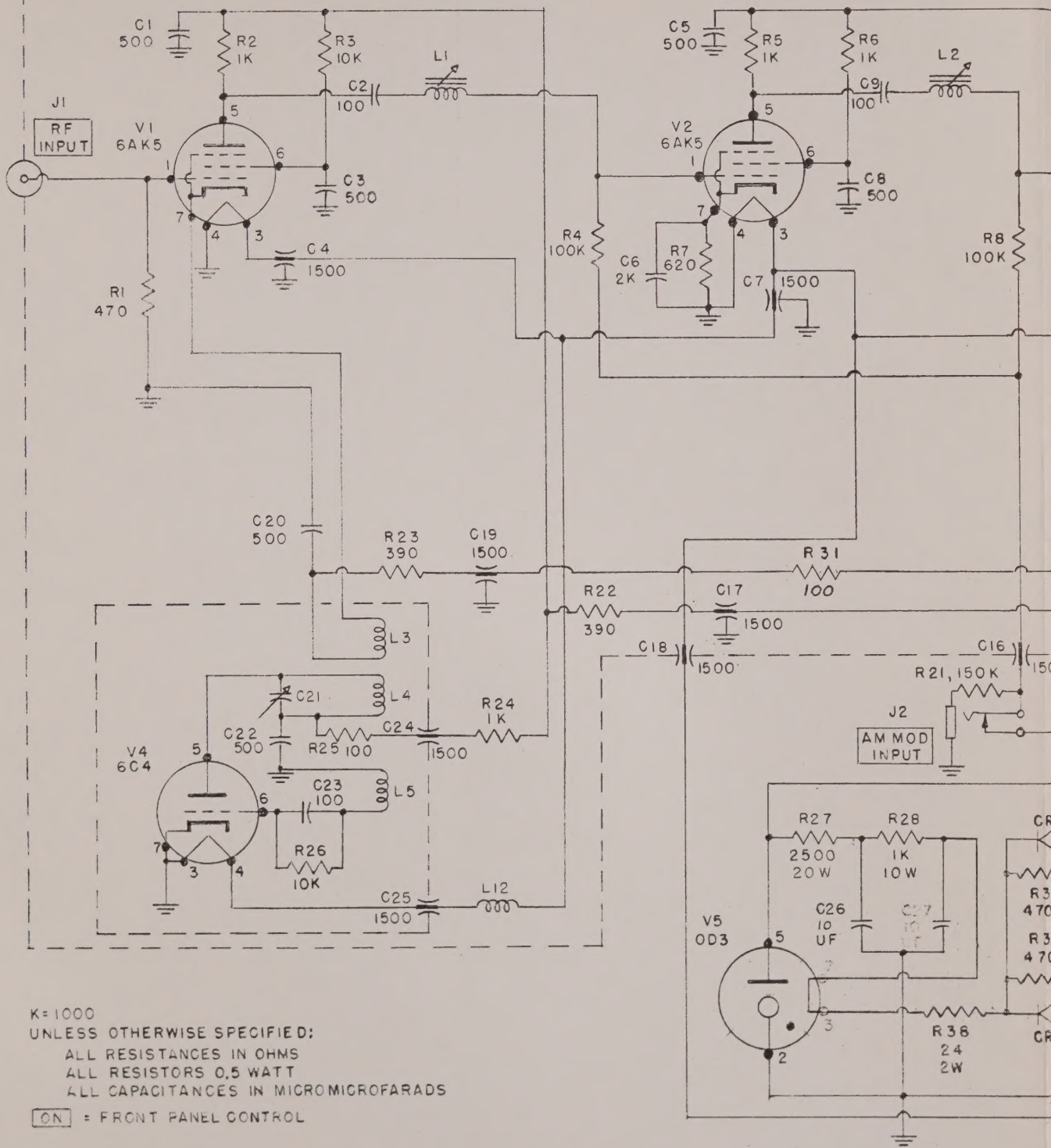
Symbol	Measurements Part Number	Description
Capacitors - Cont.		
C22	H-5010	Mica, 500 mmf, ± 20%, 500 WVDC.
C23	H-5172	Mica, 100 mmf, ± 20%, 500 WVDC.
C24	H-5011	Ceramic, feed-thru, 1500 mmf.
C25	H-5011	Ceramic, feed-thru, 1500 mmf.
C26) C27)	H-5310	Electro., 10-10 mf, 450 WVDC.
C28	H-6327	Ceramic; 1500 mmf, ± 20%, 500 WVDC.
C29	H-6327	Ceramic; 1500 mmf, ± 20%, 500 WVDC.
C30	H-6306	Ceramic; .02 mf; 600 WVDC.
Rectifiers		
CR1	H-6489	Silicon
CR2	H-6489	"
CR3	H-6489	"
CR4	H-6489	"
CR5	H-6489	"
CR6	H-6489	"
Light, Pilot		
E1	H-7745	With non-replaceable neon glow lamp.
Fuse		
F1	H-5109-6	1 amp.
Connectors		
J1	H-5707	Panel Jack
J2	H-5312	Telephone Jack
J3	H-5707	Panel Jack

Symbol	Measurements Part Number	Description
Coils		
L1	H-2525	Coil, filter
L2	H-2525	Coil, filter
L3) L4) L5)	H-2534	Coil, Oscillator
L6) L7)	H-2526	Coil, Amplifier
L8) L9)	H-2541	Coil, Amplifier
L10) L11)	H-2542	Coil, Amplifier
Choke		
L12	H-5538	Choke
Connectors		
P1		Part of W1
P2	H-7741	Male Recessed Power Receptacle
P3	H-4835	Type N
P4	H-4835	Type N
P5	H-4835	Type N
P6		Part of W1
Resistors		
R1	H-3728-471	Fixed; comp; 470 ohms, ± 10%, 1/2 watt.
R2	H-3728-102	Fixed; comp; 1,000 ohms, ± 10%, 1/2 watt
R3	H-3728-103	Fixed; comp; 10,000 ohms, ± 10%, 1/2 watt

Symbol	Meas. Corp. Part Number	Description
Resistors - Cont.		
R4	H-3728-104	Fixed; comp; 100,000 ohms, ± 10%, 1/2 watt
R5	H-3728-102	Fixed; comp; 1000 ohms, ± 10%, 1/2 watt
R6	H-3728-102	Fixed; comp; 1000 ohms, ± 10%, 1/2 watt
R7	H-3727-621	Fixed; comp; 620 ohms, ± 5%, 1/2 watt
R8	H-3728-104	Fixed; comp; 100,000 ohms, ± 10%, 1/2 watt
R9	H-3727-621	Fixed; comp; 620 ohms, ± 5%, 1/2 watt
R10	H-3728-102	Fixed; comp; 1000 ohms, ± 10%, 1/2 watt
R11	H-3728-101	Fixed; comp; 100 ohms, ± 10%, 1/2 watt
R12	H-3728-330	Fixed; comp; 33 ohms, ± 10%, 1/2 watt
R13	H-3728-471	Fixed; comp; 470 ohms, ± 10%, 1/2 watt
R14	H-3728-154	Fixed; comp; 150,000 ohms, ± 10%, 1/2 watt
R15	H-6329	Var; wirewound, 10,000 ohms, scr. dr. adj.
R16	H-6329	Var; wirewound, 10,000 ohms, scr. dr. adj.
R17	H-6329	Var; wirewound, 10,000 ohms, scr. dr. adj.
R18	H-6329	Var; wirewound, 10,000 ohms, scr. dr. adj.
R19	H-3728-154	Fixed; comp; 150,000 ohms, ± 10%, 1/2 watt

Symbol	Measurements Part Number	Description
Resistors - Cont.		
R20	H-6329	Var; wirewound; 10,000 ohms; scr. dr. adj.
R21	H-3728-154	Fixed; comp; 150,000 ohms, ± 10%, 1/2 watt.
R22	H-3728-391	Fixed; comp; 390 ohms, ± 10%, 1/2 watt.
R23	H-3728-391	Fixed; comp; 390 ohms, ± 10%, 1/2 watt.
R24	H-3728-102	Fixed; comp; 1000 ohms, ± 10%, 1/2 watt.
R25	H-3728-101	Fixed; comp; 100 ohms, ± 10%, 1/2 watt.
R26	H-3728-103	Fixed; comp; 10,000 ohms, ± 10%, 1/2 watt.
R27	H-5559	Fixed; wirewound; 2,500 ohms, ± 10%, 20 watt.
R28	H-5118	Fixed; wirewound; 1000 ohms, ± 10%, 10 watt.
R29	H-3727-511	Fixed; comp; 510 ohms, ± 5%, 1/2 watt.
R30	H-6686-6	Fixed; film; 50 ohms, ± 1%, 1/2 watt.
R31	H-3728-101	Fixed; comp; 100 ohms, ± 10%, 1/2 watt.
R32	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.
R33	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.
R34	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.
R35	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.
R36	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.
R37	H-3728-474	Fixed; comp; 470 K ohms, ± 10%, 1/2 watt.

Symbol	Measurements Part Number	Description
Resistors - Cont.		
R38	H-3733-240	Fixed; comp; 24 ohms, ± 5%, 2 watt.
R39		Part of E1.
R40	H-3728-153	Fixed; comp; 15 K ohms, ± 10%, 1/2 watt.
Switches		
S1	H-7747	Rocker
S2	H-2520	Rotary
Transformer		
T1	H-7529	Power
Tubes		
V1		Electron, 6AK5
V2		Electron, 6AK5
V3		Electron, 6AK5
V4		Electron, 6C4
V5		Electron, OD3
W1	H-7746	Cord, power, includes P1 & P6.



K=1000

UNLESS OTHERWISE SPECIFIED:

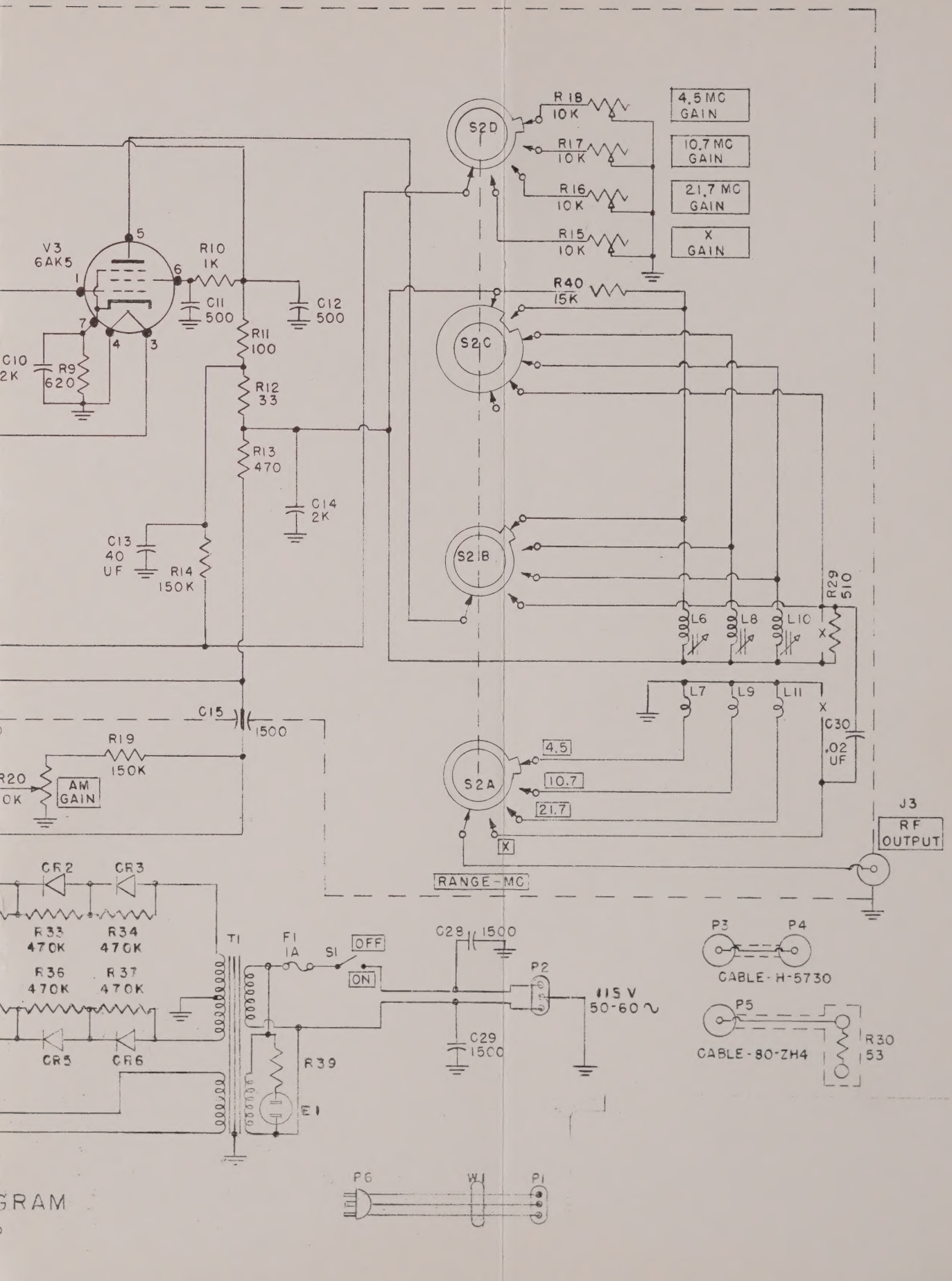
ALL RESISTANCES IN OHMS

ALL RESISTORS 0.5 WATT

ALL CAPACITANCES IN MICROMICROFARADS

[ON] = FRONT PANEL CONTROL

SCHEMATIC DIA
MODEL 27


V3
6AK5
R10
1K
C11
500
C12
500
R11
100
R12
33
R13
470
C14
2K
C13
40
UF
R14
150K
C10
2K
R9
620
C15
1500
R19
150K
R20
AM
GAIN
S2D
R18
10K
R17
10K
R16
10K
R15
10K
4.5 MC
GAIN
10.7 MC
GAIN
21.7 MC
GAIN
X
GAIN
R40
15K
S2C
S2B
S2A
L6
L8
L10
L7
L9
L11
R29
510
C30
.02
UF
4.5
10.7
21.7
X
J3
RF
OUTPUT
RANGE-MC
CR2
CR3
CR5
CR6
R33
470K
R34
470K
R36
470K
R37
470K
T1
F1
1A
S1
OFF
ON
C28
1500
C29
1500
P2
115 V
50-60 ~
R39
E1
P3
P4
CABLE-H-5730
P5
CABLE-80-ZH4
R30
53
P6
W1
P1
GRAM

VIKING LABORATORIES INC

MEASUREMENTS

BOX 180, BOONTON
NEW JERSEY

MP MASTER
MA24364